Research Article

TUJOM
ISSN:2458-9748

TURKISH JOURNAL OF MARKETING
Vol.: 5 Issue: 1 Year: 2020, pp.22-36

Citation: Sabuncu, İ., Türkan, E., & Polat, H., Customer Segmentation And Profiling With RFM Analysis, TUJOM, (2020), 5(1): 22-36 doi: http://dx.doi.org/10.30685/tujom.v5i1.84

CUSTOMER SEGMENTATION AND PROFILING WITH RFM ANALYSIS

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Received (Başvuru Tarihi): 23/03/2020
Accepted (Kabul Tarihi): 22/04/2020
Published Date (Yayın Tarihi): 25/04/2020

ABSTRACT

This paper is a case study on segmentation and profiling of customers according to their lifetime value by using the RFM (Recency, Frequency and Monetary Value) model which is an analytical method for behavioral customer segmentation. Real customer data that is gathered from a fuel station in Istanbul, Turkey is used for the case study. The data contain 1015 customers' arrival frequency, last arrival date and total spend amount in the first half of 2016, and 10 descriptor variables of customers. First, demographic characteristics of fuel station customers were analyzed by descriptive statistics. Then customers' RFM score was calculated through SPSS program, and customers were divided into 5 segments according to their RFM scores by cluster analysis. Finally, the customer profile of segments has been created by using Correspond analysis and Discriminant analysis. Although fuel station managers think that the most valuable customer for their company are automobile drivers, result of the analysis suggests that the most valuable customers are Truck drivers. At the end of the paper, recommendations are made based on customer profiles of two most valuables segments that are named VIP and GOLD.

Keywords:
Customer Lifetime Value, Segmentation, RFM Model

JEL Codes: *M31, M39, C69*

RFM ANALİZİ İLE MÜŞTERİ BÖLÜMLENDİRİLMESİ VE PROFİL OLUŞTURULMASI

ÖZ

Bu çalışma, bir veri madenciliği yöntemi olan RFM (Güncellik, Sıklık, Parasallık) modelini kullanarak müşterilerin kârlılık değerlerine göre bölümlendirilmesi ve profillerinin oluşturulması üzerine bir vaka çalışmasıdır. İstanbul, Türkiye'de bir akaryakıt istasyonundan toplanan gerçek müşteri verileri vaka çalışması için kullanılmıştır. Veriler, 2016'nın ilk yarısında 1015 müşterinin varış sıklığını, son varış tarihini ve toplam harcama tutarını ve müşterilerin 10 tanımlayıcı değişkenini içerir. İlk olarak, akaryakıt istasyonu müşterilerinin demografik özellikleri tanımlayıcı istatistikler ile analiz edilmiştir. Daha sonra SPSS programı ile müşterilerin RFM puanı hesaplanmış ve küme analizi ile RFM puanlarına göre müşteriler 5 bölüme ayrılmıştır. Son olarak, bölümlerin müşteri profili, uyum analizi ve diskriminant analizi kullanılarak oluşturulmuştur. Akaryakıt istasyonu yöneticileri, şirketleri için en değerli müşterinin otomobil kullanıcıları olduğunu düşünmesine rağmen, analiz sonucu en değerli müşterilerin kamyon kullanıcıları olduğunu göstermektedir. Makalenin sonunda, VIP ve GOLD olarak adlandırılan en değerli iki bölümün müşteri profilleri temel alınarak önerilerde bulunulmuştur.

Anahtar Kelimeler:
Müşteri Yaşam Boyu Değeri, Bölümlendirme, RFM Modeli

JEL Kodları:
M31, M39, C69

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1. INTRODUCTION

Companies cannot satisfy all potential buyers of their products or services. They should choose a group of customers that they can serve better than their competitors. In order to do this, it is necessary to segment customers and create their profiles. The main purpose of creating a customer profile is to make effective marketing strategies to target the most profitable customers.

Customer segmentation is a tool to communicate effectively with customers. By means of the partitioning process, the characteristics of the hidden customer groups are defined in the data. The partitioning process breaks down customers according to similar features. Partitioning is a preliminary step that was created to classify the identified customer groups. With segmentation, marketers can better guide resources, and are more effective in exploring opportunities.

Profiling is performed after customer segmentation. The customer profile allows marketers to provide a better service to the customer and to communicate more effectively with the existing customer. Customer's demographic and personal data are collected and brought together to form a customer profile. The customer profile is also used to find new customers using external resources.

Segmentation can be done according to demographic and psychographic properties of customers. But segmenting the customers according to their value to the company is one of the most emerging method (Armstrong et al., 2016).

Customer lifelong value, which is an important measure in marketing, especially in customer relationship management, focuses on the entire life expectancy of the customers with the business and maximizes the profits expected from the customers. Businesses can create marketing, strategy and tactics by defining their customers with their lifetime value. The value of customer life is a concept in which many academicians and many marketing managers work in practice for a long time. The main objective of the customer lifetime value is to determine the importance level of the customers for the company (Ekergil & Ersoy, 2016). Various approaches are used to determine which ones are most valuable. One of these approaches is to calculate the lifetime value of customers. The answers to the questions such as how much the company should invest in, which marketing strategies should be chosen for each customer, and which campaigns should be organized for each customer can be determined by calculating the customer lifetime value (Ekergil & Ersoy, 2016).

Long-term marketing strategies can be developed according to the customers by looking at the expected profitability of the customers with the information obtained from the customer lifetime value. It gives companies the opportunity to examine whether their customer portfolio is optimal. Optimum customer portfolio can be reached, and profitability can be increased by identifying the customers who are less profitable or unprofitable than the ones that are not worth the effort for the company.

Considering their customers' life-time value, companies can continuously increase their income and profitability by offering more attractive solutions to existing customers without focusing on gaining new customers. Trying to lure new customers can result in loss for companies.

Many methods and models are used to measure the customer lifetime value. These are divided into 2 as past and future-past behavior-based models. Past-future based models; The models are divided into 2 as models which do not include the cost of the customer's acquisition cost and the cost of the customer's purchase. All of these models utilize historical data in the customer database. The main point where they differ between the past behavior-based models and future-past behavior-based models is to assess whether the customers are active in the future. While the client considers the costs of future-based behavior-based models, they do not consider past behavior-based models (Hiziroglu & Sengul, 2012).

One of the most widely used customer lifetime value calculation models is the RFM model (Cheng & Chen, 2009). It is easy to use, can be applied quickly and is a method that is used continuously because it is easy to understand by business managers. RFM is initials of the words Recency, Frequency and Monetary. Recency means the last transaction date of the customer; Frequency means the frequency of the client's transaction; The Monetary refers to the total amount of money the customer spends. The RFM model allows to find the most likely to respond to a new proposal among existing customers.

RFM model can be used to accurately estimate customer lifetime value (CLV) (Buckinx & Van den Poel, 2005), (Fader et al., 2005), (Sohrabi & Khanlari, 2007) and for segmentation and profiling of customer (Tsiptsis & Chorianopoulos, 2011). Although there are a lot of studies showing that RFM model can be used for customer segmentation and profiling in the world such as (Piersma & Jonker, 2004), (Wei et al., 2010), (Namvar et al., 2011) , (Maryani & Riana, 2017) there are very few case studies in Turkey. These few studies applied on different sectors e-commerce sports shop (Birant, 2011), B2B industrial markets (Ekergil & Ersoy,

2016), hotel (Dursun & Caber, 2016), pizza restaurant chain (Sarvari et al., 2016), grocery chain (Peker et al., 2017), tourism (Pakyurek et al., 2018), airline (Altan, 2019), e-retailer (Kabasakal, 2020) but no other study on the fuel retailing sector could be found.

Fuel dealers are retailers that sell very similar products at almost the same price. Therefore, it is difficult for them to differentiate actual product, price and distribution channel for competition. However, they can make brand differentiation and positioning with the additional services they provide to their customers. These services should be depending on the customers' preference. But different customer types may have different service expectations. For this reason, it is important that the gas stations select the most valuable customer segment and serve in accordance with the demands of this segment. Despite this importance, no local or international study on calculating customer lifetime value for oil stations has been found. So, this case study aims to contribute implantation of customer segmentation and profiling by RFM model in Turkey by making a case study on this subject on fuel retail station.

2. METHODOLOGY AND ANALYSIS

To implementation RFM model for segmentation and profiling of the customer according to their value, the real customer data is obtained from a fuel station in Istanbul, Turkey.

The data set consists of the 1015 customers' arrival frequency, last arrival date and total spend amount in the first half of 2016, and customers' 10 descriptors variables that are summarized at Table 1 after descriptive analysis.

Table 1. Descriptive Analysis Summary Table

		Count	Layer Column
FUEL TYPE	Ecto Euro Diesel	418	41.2%
	Ecto Pro Diesel	221	21.8%
	Unleaded95	93	9.2%
	LPG	283	27.9%
GENDER	Male	893	88,0%
	Female	122	12,0%
VEHICLE TYPE	Automobile	796	78,4%
	SUV	0	0,0%
	Light Commercial	104	10,2%
	Minibus	44	4,3%
	Autobus	33	3,3%
	Truck	25	2,5%
	Trailer	13	1,3%
USAGE METHOD	Commercial	104	10,2%
	Personal	815	80,3%
	Taxi	96	9,5%
PROFESSION	Freelancer	464	45,7%
	Tradesman	171	16,8%
	Free-earner	206	20,3%
	Driver	174	17,1%
	Other	0	0,0%
FAVORITE TEAM	Beşiktaş	207	20,4%
	Fenerbahçe	303	29,9%
	Galatasaray	259	25,5%
	Trabzonspor	138	13,6%
	Bursaspor	36	3,5%
	Other	72	7,1%
PAYMENT METHOD	Credit Card	484	47,7%
	Cash	522	51,4%
	Other	9	0,9%
EDUCATION	Primary School	292	28,8%
	High School	518	51,0%
	University and Higher	205	20,2%
SMARTPHONE	Yes	978	96,4%
	No	37	3,6%
AGE	19-30	277	27,3%
	31-45	465	45,8%
	46-70	273	26,9%

The customers data is used to calculate customer lifetime value by using RFM model, then customers are segmented with clustering analysis. The last purchase date is used for Recency, arrival frequency is used as Frequency and total spend amount is used for Monetary Value. To calculate RFM score of each customer, RFM related data is encoded in five equal portions (Hughes, 1996), (Wei et al., 2010): Customer's purchase date that is sorted in descending order of timeliness case. The top 20% segment is coded as 5, while the next 20% segment is coded as 4 and so forth. Finally, the recency for each customer in the database is denoted by a number from 5 to 1. The frequency of customer visits and purchase data are also sorted in descending order. All customers conferred by 555, 554,553, …..111, this creates 125

(5x5x5) RFM cells. In this way, customer database is divided into 125 parts. Customers who have the highest RFM score are the most profitable customers.

The RFM score of each customer is added to data set as an extra column for further analysis. The RFM Histograms that is given in Figure 1, shows that majority of customers' last purchase that is after June (the current month), they made purchase below 30 times for six months (first half of 2016) and spend between 0 and 39000 TL.

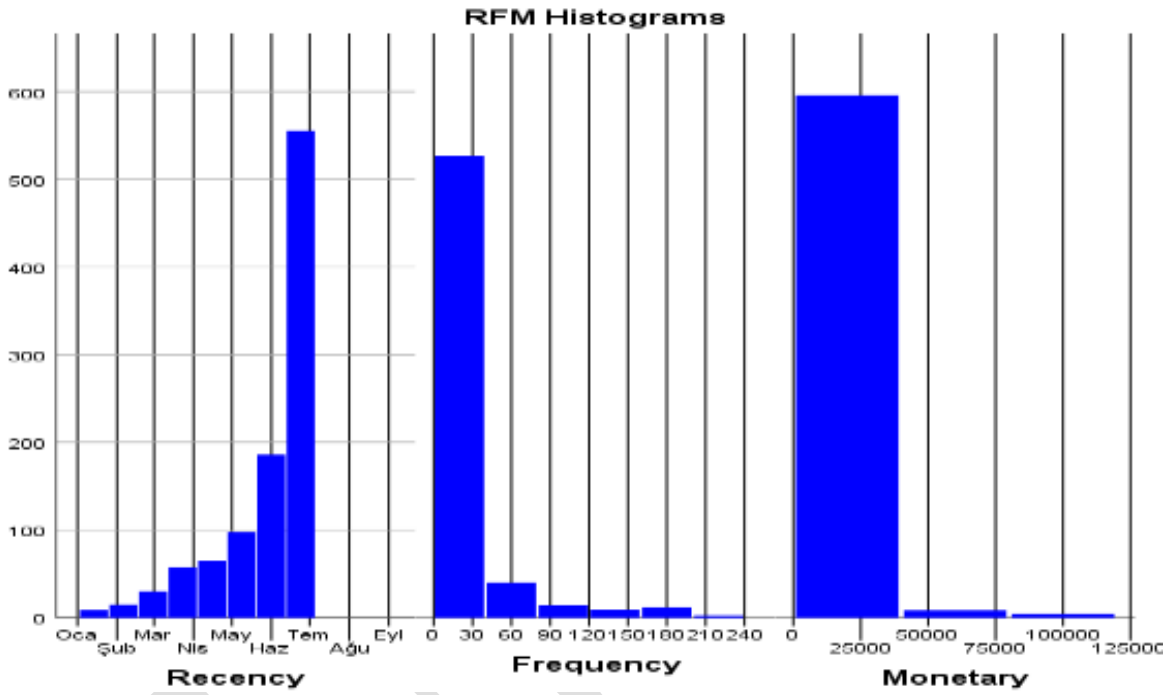

Figure 1. RFM Histogram

RFM score is used for the clustering analysis to segment the 1015 customers of the fuel station. As a result of the analysis, customers with similar characteristics were grouped in 5 groups. The average RFM scores of each segment are shown in Figure 2. The names of the segments were determined by being inspired by (Berman, 2006). The number of customers is 25 and the segment with an average of 949 RFM points is called VIP and it is seen that the most valuable segment is the fuel station. The Gold segment is the second most valuable segment with 226 customers and an average of 890 RFM points. Silver customers with a customer number of 292 and an average of 651 RFM points are in the third most valuable segment. Platinum customers, which have a customer number of 249 and an average of 415 RFM points, are in the fourth most valuable segment. Normal segment is the fifth most valuable segment with 223 customers and average of 205 RFM points.

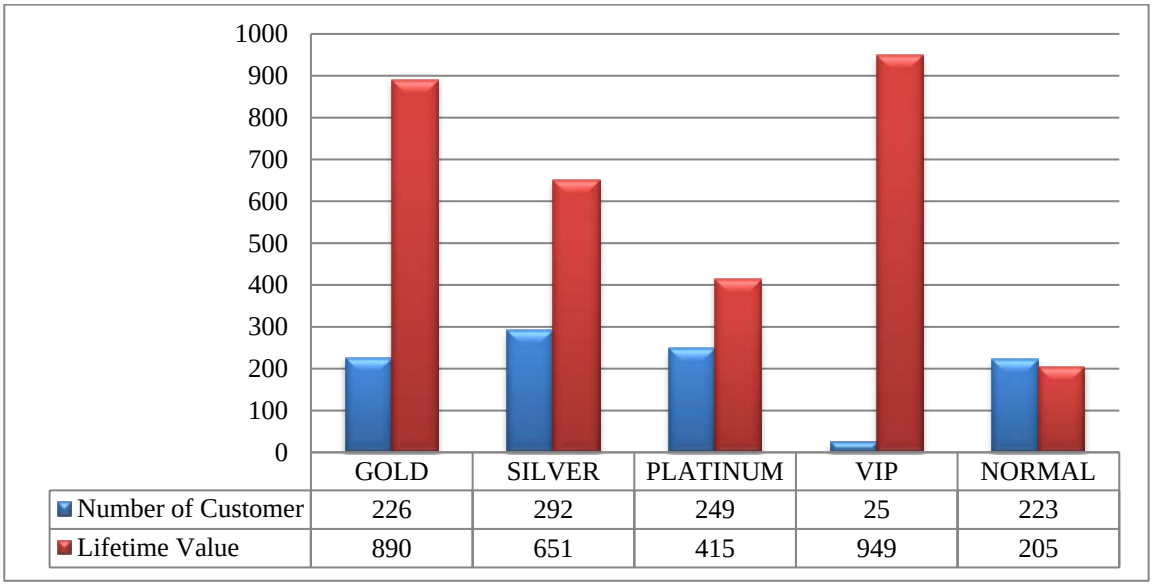

Figure 2. RFM Histogram

In order to profile customer segments according to descriptor variables discriminant analysis and correspondence analysis was performed. Discriminant analysis is the statistical measurement technique that allows us to see the differences between the groups, namely the characteristics that distinguish one group from the other (Charan, 2015). By discriminant analysis the differences of 10 descriptors and 2 basis variables (Frequency and RFM scores) for each segment were tested. The results that is given in Table 2 shows that the variables are differentiated for each segment and classification of segments according to these variables are meaningful except gender and smartphone usage variables.

Table 2. Tests of Equality of Group Means

	Wilks' Lambda	F	df1	df2	Sig.
FUEL TYPE	,945	14,718	4	1010	,000
GENDER	,992	2,017	4	1010	,090
VEHICLE TYPE	,797	64,450	4	1010	,000
USAGE METHOD	,890	31,075	4	1010	,000
PROFESSION	,930	18,925	4	1010	,000
FAVORITE TEAM	,968	8,312	4	1010	,000
PAYMENT METHOD	,979	5,353	4	1010	,000
EDUCATION	,973	6,899	4	1010	,000
SMARTPHONE USAGE	,998	,476	4	1010	,753
AGE	,983	4,289	4	1010	,002
TOTAL EXPENTURE	,388	397,756	4	1010	,000
FREQUENCY	,429	335,405	4	1010	,000
RFM SCORE	,066	3596,704	4	1010	,000

Table 3. Correspondence Analysis Summary Table of VIP and GOLD Segments

VIP Segment				GOLD Segment			
Variables		**F**	**Percent**	**Variables**		**F**	**Percent**
FUEL TYPE	Ecto Euro Diesel	12	1,20%	**FUEL TYPE**	Ecto Euro Diesel	127	12,50%
	Ecto Pro Diesel	13	1,30%		Ecto Pro Diesel	29	2,90%
	Unleaded95	0	0,00%		Unleaded95	17	1,70%
	LPG	0	0,00%		LPG	53	5,20%
GENDER	Male	25	2,50%	**GENDER**	Male	207	20,40%
	Female	0	0,00%		Female	19	1,90%
VEHICLE TYPE	Automobile	0	0,00%	**VEHICLE TYPE**	Automobile	174	17,10%
	SUV	0	0,00%		SUV	0	0,00%
	Light Commercial	0	0,00%		Light Commercial	23	2,30%
	Minibus	5	0,50%		Minibus	9	0,90%
	Autobus	5	0,50%		Autobus	8	0,80%
	Truck	12	1,20%		Truck	8	0,80%
	Trailer	3	0,30%		Trailer	4	0,40%
USAGE METHOD	Commercial	22	2,20%	**USAGE METHOD**	Commercial	36	3,50%
	Personal	3	0,30%		Personal	168	16,60%
	Taxi	0	0,00%		Taxi	22	2,20%
PROFESSION	Freelancer	3	0,30%	**PROFESSION**	Freelancer	97	9,60%
	Tradesman	0	0,00%		Tradesman	46	4,50%
	Free-earner	2	0,20%		Free-earner	37	3,60%
	Driver	20	2,00%		Driver	46	4,50%
	Other	0	0,00%		Other	0	0,00%
FAVORITE TEAM	Beşiktaş	6	0,60%	**FAVORITE TEAM**	Beşiktaş	54	5,30%
	Fenerbahçe	8	0,80%		Fenerbahçe	72	7,10%
	Galatasaray	9	0,90%		Galatasaray	65	6,40%
	Trabzonspor	2	0,20%		Trabzonspor	13	1,30%
	Bursaspor	0	0,00%		Bursaspor	10	1,00%
	Other	0	0,00%		Other	12	1,20%
PAYMENT METHOD	Credit Card	12	1,20%	**PAYMENT METHOD**	Credit Card	102	10,00%
	Cash	13	1,30%		Cash	123	12,10%
	Other	0	0,00%		Other	1	0,10%
EDUCATION	Primary School	15	1,50%	**EDUCATION**	Primary School	83	8,20%
	High School	10	1,00%		High School	105	10,30%
	University and Higher	0	0,00%		University and Higher	38	3,70%
SMART PHONE	Yes	25	2,50%	**SMART PHONE**	Yes	219	21,60%
	No	0	0,00%		No	7	0,70%
AGE	19-30	4	0,40%	**AGE**	19-30	44	4,30%
	31-45	15	1,50%		31-45	102	10,00%
	46-70	6	0,60%		46-70	80	7,90%

As a result of correspondence analysis, segments were examined and interpreted through their relationships between the categories of each variable. By this analysis, the frequency of each variable in the data set determined for the segments. Table 3 shows correspondence analysis results for the most valuable segments that are named VIP and GOLD. In the table, percent shows the indicated variable value percentage in all customers not only the customers of the segment.

All analysis was made by using SPSS statistic software. But supported graphs and figures to enrich analysis are made in MS Excel. The interpretation of analysis results and marketing strategies according to these results for most valuable segments are developed in the following sections.

3. FINDINGS

The results of analysis are summarized in Table 4. The highest frequency values of the descriptor variables are shown in the Table. According to the table, customers in the most valuable VIP segment use Ecto Euro Diesel and Ecto Pro Diesel as fuel type. These customers are predominantly trucks, buses and minibuses drivers that use their vehicles for commercial purposes. They are usually primary school graduates, males, between the ages of 31-45 and support Galatasaray as their favorite team. They make their payments in cash and use Smart Phone. In this segment, the average of the RFM scores of the customers is 948, the total expenditure is 76.227 TL and the arrival frequency is 206 for six months.

Table 4. Summary Table

Segments	Number of Customer	Frequency	Monetary Value	RFM Score	Fuel Type	Vehicle Type	Vehicle Usage
VIP	25	206	76.227	949	Euro,Pro	Truck	Commercial Vehicle
Gold	226	45	4.725	890	Euro	Automobile	Private Vehicle
Silver	292	17	1.158	651	Pro	Automobile	Private Vehicle
Platinum	249	15	1.596	415	LPG	Automobile	Private Vehicle
Normal	223	13	1.168	205	Euro	Automobile	Private Vehicle

Segments	Way of Working	Age	Gender	Educational Status	Favorite Team	Payment Method	Using Smartphone
VIP	Driver	31-45	Male	Primary School	Galatasaray	Cash	Yes
Gold	Freelancer	31-45	Male	High School	Fenerbahçe, Galatasaray	Cash, Credit Card	Yes
Silver	Freelancer	31-45	Male	High School	Trabzonspor	Cash	Yes
Platinum	Freelancer, Tradesman	31-45	Male	High School	Galatasaray	Cash, Credit Card	Yes
Normal	Freelancer, Driver	31-45	Male	High School	Fenerbahçe	Credit Card	Yes

Customers in the Gold segment are generally self-employed or business people who prefer Ecto Euro Diesel fuel type. They use Automobile vehicles for personal use. They are mainly male and high school graduates. They make payments by cash or credit card and use

Smart Phone. RFM scores of the customers in this segment is 890, while the total expenditure is 4.725 and the arrival frequency is 45. The other segments profile can be seen in Table 5, too.

Table 5 represents the summary table of RFM score averages and percentages of variables. The values that have the highest RFM score of each variable are marked. Customers who have demographic characteristics with high RFM scores are valuable for the company. So, this table shows the most important descriptor values that can be used for targeting new customers and promotion studies. As a result of the RFM analysis, male, over 31 and commercial truck drivers are the most valuable for the fuel company. Galatasaray team supporters seem to have the highest average RFM score. In terms of payment, customers mainly prefer cash. This information is used to generate recommendations in the last section.

Table 5. General RFM Average of Each Variable

		Mean	Count	Layer N %
FUEL TYPE	Ecto Euro Diesel	567	418	41,2%
	Ecto Pro Diesel	596	221	21,8%
	Unleaded95 Oktan	460	93	9,2%
	LPG	539	283	27,9%
GENDER	Male	564	893	88,0%
	Female	492	122	12,0%
VEHICLE TYPE	Automobile	550	796	78,4%
	SUV	.	0	0,0%
	Light Commercial	553	104	10,2%
	Minibus	494	44	4,3%
	Autobus	542	33	3,3%
	Truck	804	25	2,5%
	Trailer	698	13	1,3%
USAGE METHOD	Commercial	670	104	10,2%
	Personal	543	815	80,3%
	Taxi	541	96	9,5%
PROFESSION	Freelancer	565	464	45,7%
	Tradesman	571	171	16,8%
	Free-earner	502	206	20,3%
	Driver	579	174	17,1%
	Other	.	0	0,0%
FAV. TEAM	Beşiktaş	568	207	20,4%
	Fenerbahçe	517	303	29,9%
	Galatasaray	599	259	25,5%
	Trabzonspor	579	138	13,6%
	Bursaspor	579	36	3,5%
	Other	534	72	7,1%
PAYMENT METHOD	Credit Card	527	484	47,7%
	Cash	583	522	51,4%
	Other	559	9	0,9%
EDUCATION	Primary School	595	292	28,8%
	High School	548	518	51,0%
	University and Higher	520	205	20,2%
SMARTPHONE USAGE	Yes	558	978	96,4%
	No	494	37	3,6%
AGE	19-30	516	277	27,3%
	31-45	570	465	45,8%
	46-70	573	273	26,9%

4. CONCLUSIONS AND RECOMMENDATIONS

There are many alternatives for customers in the fuel station sector. For this reason, business owners need to understand the needs of their customers in order to stand out from their competitors, and to develop their services in line with the demands and needs of the customers. In this area where competition is intense, the company should increase the loyalty of the customers by making them feel special, valuable and should even be convinced to remain a customer of the enterprise even in the case of alternative stations or campaigns. It should be ensured that this customer group, which is called this loyal customer, should offer this business to his / her family and environment. Thus, establishing long and lasting relationships with customers will be easier to get to know them better and to offer them special services. By creating customer profiles, businesses can increase the expected profits by offering the right people the right service, discount, campaign and benefits. In order to do this, a database has been created for fuel station customers based on CLV that are calculated by using RFM model.

As a result of the analysis, customers are divided into 5 segments according to their RFM scores and the VIP segment is the most valuable segment for the fuel station while the Gold segment is the second most valuable segment. Fuel station managers think that the most valuable customer for their companies are Automobile users while the fact that the most valuable customers are Truck users and the second most valuable customers are Automobile users. Thus, this study also showed that intuitive segmentation may differ from reality and scientific segmentation methods should be used. It is very important for the fuel station to keep the customers in this segment and to make efforts to make them a loyal customer. The gas station should develop strategies to keep its most valuable customers. Here are some suggestions based on valuable segments profiles:

1- 52% of VIP customers use Ecto Pro Diesel as fuel type. Therefore, for this type of fuel, the number of pumps in the station can be increased to 52% and thus the waiting times of the customers can be shortened.

2- 36% of the customers in the VIP segment support the Galatasaray team, so Galatasaray is the favorite team for the company. For fans, products such as toy mascot, keychain, magnet, etc can be provided with 36% of the section. If this team becomes a champion or wins a cup, a greeting can be sent to customers. In this way, the company can show the importance of the football team supported by the customers can increase the loyalty of their customers.

3- 48% of the customers in the VIP segment use trucks. It can allocate 48% of the technical products for vehicles to truck engine oil and oil maintenance filters.

4- For the valued customers of 80% of the drivers to communicate more with their families on long journeys, a deal can be made with the operators to receive a certain amount of fuel or to give them a gift minute if they collect fuel points.

5- The entire VIP segment and the majority of the customers are male customers. For these customers, products that meet the personal care needs of men in their markets can be sold.

6- The company can make VIP customers feel special by sending them a special message on their birthday. Also, the company may allocate some of its budget for advertising campaigns only to VIP customers and offer them special gift certificates and match tickets. In this way, it can increase their loyalty to the company by making its' customers feel valued.

7- All of the VIP customers, 96.4% of all customers are using smartphones in firm general. The existing mobile application can be encouraged by using advertising campaigns and leaflets. Customers' fuel payments can be made via mobile with the smartphone app. Changes in fuel prices, advertisements and campaigns organized by the station can be presented to customers as video messages.

8- A service can be developed to report on the arrival frequency and fuel consumption information of VIP customers in electronic environment and to control fuel consumption. In this way, special campaigns and strategies can be developed if there is a decrease in the loyalty of customers. In order to support customer loyalty, people who have long and frequent purchases can receive 2 times the fuel grade.

9- The company can offer value-added services such as car wash to its customers in the VIP and Gold segment once they have a certain amount of monthly shopping.

10- The VIP segment customers are the most valuable customer segment for the company. They consist of primary school graduates and male customer between the ages of 31-45. When the company advertises it narrows their target audience and directs towards the right audience and manages its budget properly.

Gas station managers should develop campaigns and promotions according to their customers' needs and demands in order to increase their loyalty. However, it is not possible to make campaigns that will satisfy all customers due to the budget constraint. As a matter of fact, customers' preferences may differ. Therefore, it is necessary to identify the most valuable

customer segments and focus on the needs of these segments. In this study, the RFM model has been shown to be a useful segmentation tool for gas stations, which can also be used for this purpose. With RFM analysis, customer segmentation, customer profile and marketing strategies have been developed thanks to the important information received from the fuel station regarding the frequency of incidence, arrival time and total expenses of the customers.

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